THE GAMMA-RAY SPECTRA OF SOME LIGHT ELEMENTS

BY

FREDERICK WILLIAM STALLMANN

A.B., Illinois College, 1935

A.M., University of Illinois, 1937

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PHYSICS
IN THE GRADUATE SCHOOL OF THE UNIVERSITY
OF ILLINOIS, 1940

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ACKNOWLEDGMENT

The writer is grateful to Professor P. Gerald Kruger for the great amount of direction and assistance given him.

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An investigation of the gamma-rays from B^{10} by means of pairs produced in the gas of a cloud chamber gave rise to twenty-three lines. These could be satisfactorily accounted for by nine energy levels at 4.73, 3.64, 2.92, 1.93, 1.44, 0.61, 0.50, and 0.26 Mev. These agree with the neutron spectrum from the same reaction.

A study of the gamma-rays from O^{16} formed when fluorine is bombarded with 1.5 Mev protons showed that instead of one single line as had been previously found, there were three lines of 5.52, 6.20, and 6.76 Mev. These lines could not have been resolved in the previous work but would actually appear as one line of approximately 6.3 Mev as found. These lines agree well with the theoretical levels predicted by Dennison who classified them as $3- = 5.1$; $2+ = 6.29$; $2- = 6.3$ and $1- = 6.6$. As can be seen it would have been impossible to have resolved the 2+- and 2— level.

Superimposed on the O^{16} spectrum was a spectrum which has been tentatively assigned to Ne^{20}. Nine lines are accounted for by an energy level scheme having levels at 1.42, 4.09, 5.05, 7.33, 9.20, and 9.61 Mev. These agree with the excited stated predicted by Bonner from the neutron groups obtained by bombarding fluorine with deuterons leaving the Ne^{20} in an excited state. However, more data are necessary before these levels can be definitely attributed to Ne^{20}.

VITA

Frederick William Stallmann was born in Worden, Illinois, January 1, 1914. He attended grade school and high school in Staunton. Illinois, graduating in 1931. In 1935, he received his A.B. from Illinois College. Since that time he has been doing graduate work in physics at the University of Illinois and received his A.M. in 1937. While at the University he has been a University Service Fellow for three years and an assistant in the Department of Physics for two years.